Radiation Shielding Materials Containing Hydrogen, Boron and Nitrogen

Sheila Thibeault

NASA must solve many technical challenges before it can send astronauts to Mars. Creating a propulsion system powerful enough for a heavy spacecraft to go the distance and dealing with the psychological effects of living in space for that period of time are both major issues. But, an environmental problem could actually prevent a mission from ever happening. Space radiation.

Space radiation exposure can break human DNA molecules

Space radiation can cause serious damage to human DNA. It can also cause a variety of long term ailments including cataracts, cancer, and sterility. With current technology, humans cannot travel beyond low Earth orbit (LEO) for more than 100 days and still stay below permissible radiation exposure limits.

To solve this problem, scientists at NASA Langley Research Center are looking into different ways to protect astronauts, including the creation of new materials with better radiation shielding capabilities.

“The smaller the element, the more effective it is for breaking up large radiation particles. So, I’m looking at light elements, in particular, I’m looking at hydrogen, boron and nitrogen” says Sheila Thibeault, a Senior Research Physicist at Langley.

Thibeault received funding from the NASA Innovative Advanced Concepts (NIAC) Program to develop a radiation shielding material containing boron nitride nanotubes (BNNTs). BNNTs, which are composed completely of boron and nitrogen, have extraordinary strength and are extremely effective at absorbing neutrons.

Neutron radiation is produced when galactic cosmic radiation and solar energetic particles interact with the walls of space structures like vehicles and habitats, or the surfaces of planets and moons. This secondary type of radiation is very damaging to humans, especially with regard to the formation of radiogenic cancers.

One benefit of the material Thibeault is developing is that it’s structural, which means it could be used in the fabric of spacecraft, spacesuits and astronaut clothing to provide multiple layers of protection at one time.

New radiation shielding materials could be used to create the vehicles astronauts use to explore

Thibeault’s goal is to develop a material that will help NASA extend space missions to a full year, but she also believes it will have many practical applications on Earth.

“Pilots on high-altitude aircraft, the Concorde for example, wore dosimeters. . . . So our materials could lend themselves to high altitude aircraft structures and fabric applications also.

“We are excited because we think we’re doing something that is truly innovative and that will have a high return.”